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(54) IMPROVEMENTS IN OR RELATING TO PNEUMATIC TYRES

(71) We, PNEUMATIQUES CAOUTCHOUC MANUFACTURE ET PLASTIQUES KLEBER-COLOMBES, a French Body Corporate, of Place de Valmy, 92 Colombes, France, do hereby declare the invention, for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement:—

The present invention relates to pneumatic vehicle tyres which are intended to move over unstable or slippery surfaces such as earth, mud or snow and which for this reason have a tread pattern which comprises bar-like ribs which are spaced apart for penetration into soft ground so as to provide a meshing action which increases grip and enables the drive torque to be transmitted with the minimum of slip. The invention relates more especially to pneumatic tyres intended for fitting to the driving wheels of agricultural tractors and similar vehicles.

One of the objects of the invention is in particular to increase grip under the most difficult working conditions when the tyres tend to sink deeply into very soft ground.

Accordingly, the invention consists in a pneumatic vehicle tyre intended to move over loose or slippery ground, particularly for the driving wheels of agricultural tractors or similar vehicles, comprising a tyre body having bead heels separated by an axial distance which, when the tyre is mounted on its rim and inflated is approximately equal to the width of the tread, and sidewalls which, under the same conditions, curve axially outwards connecting the beads to the sides of the tread, said tread comprising circumferentially spaced ribs which, in the central region of the tread, extend alternately from that region to the two tread edges, and each pair of ribs which are next adjacent in said central region, substantially form a V, wherein, on at least one side of the tyre, the outer lateral parts of said ribs are extended in continuous manner to the level of the corresponding bead by ridges which project from the corresponding sidewall of the tyre so that their lower ends bear on the bead-retaining flange of the rim when the tyre is fitted thereto and inflated.

In order that the invention may be more clearly understood, reference will now be made to the accompanying drawings which show three embodiments thereof by way of example, and in which:—

Figs. 1 and 2 are cross-sectional and plan views of a first embodiment, and

Figs. 3 and 4 are cross-sectional views of two other embodiments.

Referring now to the drawings, the tyres shown have a body 1 having axially spaced beads 2, a crown 3 which carries a patterned tread 4, and sidewalls 5 which link the margins of the crown to the beads 2. The body 1 is reinforced by a carcass 6 formed by one or more layers or plies of textile or metal cords the edges of which are folded over around the wires 7 in the beads, 2. The carcass 6 may be of the cross or diagonal-ply type or of the radial type. In the latter case, the crown of the tyre is confined by a reinforcing belt 8 which restricts the outside diameter of the tyre when inflated, this belt being positioned between the crown of the carcass 6 and the tread 4. The belt 8 is formed for example by two or more layers or plies of textile or metal cords which are orientated at small angles, of the order of 20°, to the equatorial plane to form with the radial carcass an annular band which is substantially inextensible in the circumferential direction. This conventional construction for the belt may be replaced by one of the many other known constructions. When the tyre is mounted on its rim 10, the axial spacing A of the beads between the edges of the rim is approximately equal to the width B of the tread in order to ensure that the tyre has good lateral stability. Generally speaking, the spacing A is less than or equal to the width B of the tread. When the tyre is inflated the sidewalls 5 are thus curved axially outwards with respect to the beads of the tyre when on its rim.

Because tyres according to the invention are intended for fitting to the driving wheels of agricultural tractors or other vehicles or machines which operate on similar terrain, the pattern of the tread 4 is a heavy one, formed in essence by high, thick transverse ribs 9 which are spaced apart circumferentially by a distance D which is equal to at least twice their own thickness E and which is generally between 4

and 7 times the thickness E, the distance D being however less than the length of the contact area of the tyre on the ground under normal load. The ribs 9 in the central region of the tread extend alternatively from that region to the two tread edges, and each pair of ribs which are next adjacent in said central region, substantially form a V, as shown in Fig. 2.

In the tyres in question, the outer lateral parts 9*a* of the ribs 9 on the tread continue uninterruptedly into ridges 9*b* which extend for the entire height of the sidewalls 5 to the beads 2 so that their lower ends rest against the bead-retaining flanges 10*a* of the rim carrying the tyre. In the embodiments illustrated, the ridges 9*b* lie in a broadly radial direction and they project from the curved outer faces of the sidewalls for an axial distance which may be of the order of 5 to 50 mm depending upon the size of the tyre. Preferably, the distance *e* for which the ridges project is not very much greater than their thickness E so that the ridges 9*b* will not flex under the strain of traction. These lateral ridges 9*b* form an additional pattern of vane-like members which are spaced apart by a distance equal to the spacing D between the ribs 9. This lateral pattern comes into action when the tyre sinks deeply into soft ground and it then provides extra grip which delays the outset of tyre slip under difficult working conditions. The effectiveness of the lateral ridges 9*b* is increased to its maximum by the fact that they extend for the entire height of the sidewalls up to the point where they come into contact with the edges of the rim and by reason of their heavy build similar to that of the ribs 9 of the tread from which they continue. They also have the effect of forming on the sidewalls 5 of the tyre pillars or buttresses which tend to reduce the inherent radial flexibility of the sidewalls. The sidewalls so reinforced flex less than those of a corresponding tyre with the result that the flexing of the tyre occurs more in the area of the crown. This increases the mobility of the ribs 9 of the main pattern at the exit from the area in contact with the ground and assists in the self-cleaning action of the tyre. The lateral ridges 9*b* also provide protection for the sidewalls 5 against cuts, when the tyre is used on broken and stony ground.

The tyre illustrated in Fig. 3 is generally similar to that shown in Figs. 1 and 2 except that the ribs 9 of the main tread pattern extend transversely, at the ends where their outer lateral parts 9*a* are situated, beyond a vertical plane tangent to the corresponding curved sidewall. The tyre being symmetrical, the result is that the width B of the tread pattern is greater than the maximum width G of the body of the tyre; which gives a wider tread area so that the grip of the tyre and its tractive ability are further enhanced.

In addition, the tyre has at the bottom of its sidewalls 5 a continuous circular fillet 14 to which are connected the lower parts of the lateral ridges 9*b*, which assists in giving the lateral ridges stiffness in flexion. These fillets 14 have a lower face which is shaped to fit round the corresponding edge 10*a* of the rim in order to prevent earth and mud from getting between the rim and the bead.

Fig. 4 illustrates another embodiment of the invention in which the body 1 of the tyre has sidewalls 5 which are distinctly shorter than those of the tyres previously described, which gives the body 1 of the tyre a low cross-section in which the ratio of the cross-sectional height H over the width G of the body of the tyre is less than 0.6 and is preferably between 0.3 and 0.5. This tyre has a wide tread which promotes grip and a low height which gives it good lateral stability. As in the case of Fig. 1, the lateral ridges 9*b* continue from the main spaced ribs 9 of the tread pattern to the bottom of the sidewalls 5 so as to provide extra grip when the tyre is moving while sunk into soft ground. These lateral ridges 9*b* also assist in the self-cleaning action of the pattern.

As in the case of the tyre of Fig. 3, this tyre also may have a tread pattern which is widened sideways and whose transverse width B is greater than the width G of the body 1 in the curved area of the sidewalls, as well as continuous circular fillets 14 which fit round the outer edges 10*a* of the rim 10 and to which the ridges 9*b* of the lateral pattern are connected.

Other embodiments may be deduced from the examples described and illustrated. In particular, the lateral ridges 9*b* may be provided on only one sidewall 5 of the tyre or may project to a greater extent on one of the sidewalls than on the other, in particular as dictated by the space available on the vehicle for the passage of the wheels.

WHAT WE CLAIM IS:—

1. A pneumatic vehicle tyre intended to move over loose or slippery ground, particularly for the driving wheels of agricultural tractors or similar vehicles, comprising a tyre body having bead heels separated by an axial distance which, when the tyre is mounted on its rim and inflated is approximately equal to the width of the tread, and sidewalls which, under the same conditions, curve axially outwards connecting the beads to the sides of the tread, said tread comprising circumferentially spaced ribs which in the central region of the tread, extend alternately from that region to the two tread edges and each pair of ribs which are next adjacent in said central region, substantially form a V, wherein, on at least one side of the tyre, the outer lateral parts of said ribs are extended in continuous manner to the level of the corresponding bead by ridges which project from the corresponding sidewall of the tyre so that their lower ends bear on the bead-retaining flange of the rim when the tyre is fitted thereto and inflated.

2. A tyre as claimed in claim 1, wherein said

projecting ridges have a generally radial direction.

3. A pneumatic tyre as claimed in claim 1 or 2, in which the ribs of the tread pattern are spaced apart circumferentially by at least twice their thickness.

4. A pneumatic tyre as claimed in claim 1 or 2, wherein on at least one side of the tyre the outer lateral parts of said ribs extend beyond a vertical plane tangent to the corresponding curved side wall.

5. A pneumatic tyre as claimed in any of the preceding claims, wherein the lower parts of said lateral ridges are consituted by a continuous circumferential fillet which interconnects said lower parts and fits round the corresponding bead-retaining flange of the rim.

6. A pneumatic tyre as claimed in any of the preceding claims, and having short sidewalls which give the body of the tyre a low cross-section in which the ratio of height over width is less than 0.6.

7. A pneumatic tyre as claimed in claim 6, wherein said ratio is between 0.3 and 0.5.

8. A pneumatic tyre substantially as hereinbefore described with reference to Figs. 1 and 2 of the accompanying drawings.

9. A pneumatic tyre substantially as hereinbefore described with reference to Fig. 3 of the accompanying drawings.

10. A pneumatic tyre substantially as hereinbefore described with reference to Fig. 4 of the accompanying drawings.

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Sheet 1

Fig.1

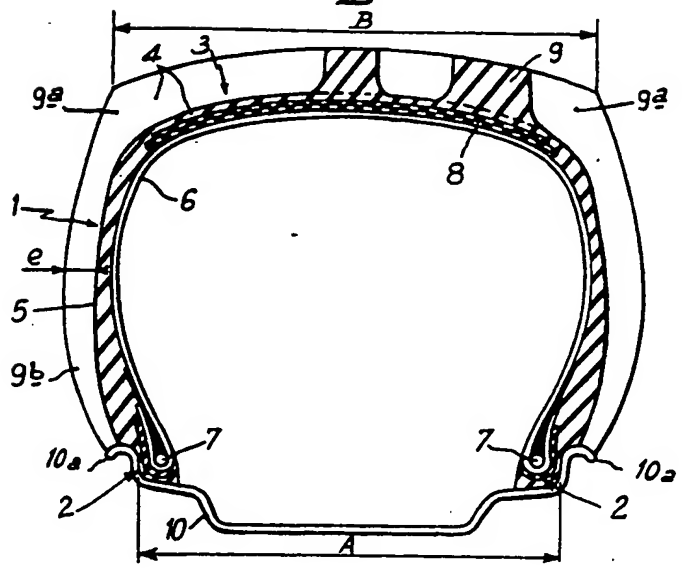
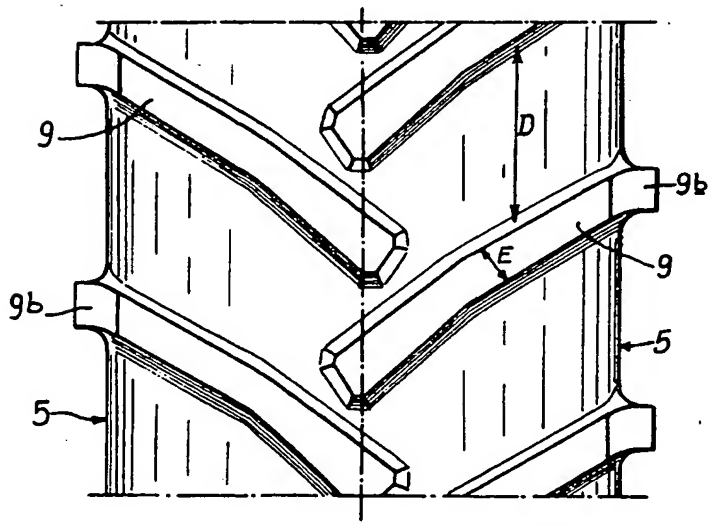


Fig.2



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Sheet 2

Fig: 3

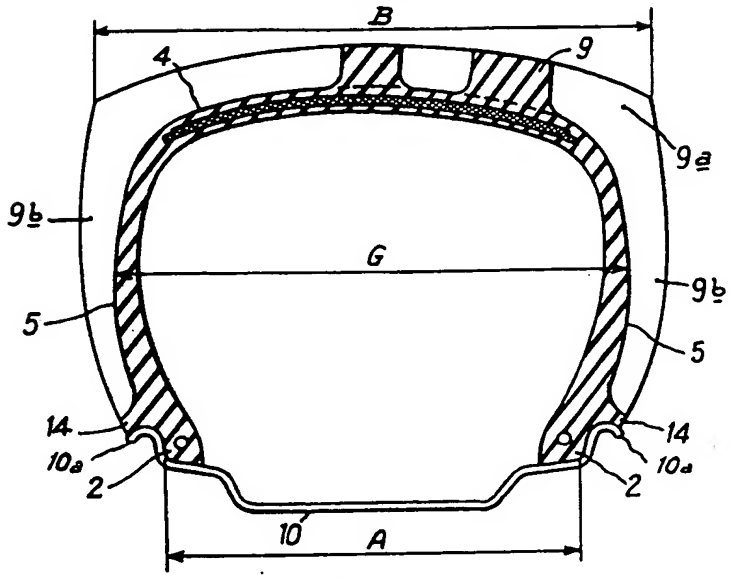

Fig: 4